

Standard Specification  
for  
Power & Control Cables

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## 1. GENERAL:

- 1.1 This specification covers design, manufacture, testing, inspection, packing and dispatch, to destination of Copper Cored Control Cables and aluminum cored Power Cables. Submission of Drum drawings as per relevant IS.
- 1.2 The cables covered by this specification shall be designed, manufactured and tested in accordance with latest edition of Indian Standards as well as relevant IEC's.

## 2. POWER AND CONTROL CABLES [FOR WORKING VOLTAGES UP TO AND INCLUDING 1100 V]

### 2.1 CRITERIA FOR SELECTION OF LT POWER & CONTROL CABLES:

- a. Aluminium conductor XLPE insulated armoured cables shall be used for main power supply purpose from LT Aux. Transformers to control room, between distribution boards, for power supply to oil filtration units, from ACDB to DG set and for supply from control room to colony lighting.
- b. Aluminium conductor PVC insulated armoured power cables shall be used for various other applications in switchyard area/control room.
- c. For all control/protection purposes, PVC insulated armoured control cables of minimum 2.5 mm<sup>2</sup> size with stranded Copper conductors shall be used.  
(Note: LT cables with 1.5 mm<sup>2</sup> size is also acceptable, only for status signal. Data sheet of same needs to be approved by Employer).
- d. Cables shall be laid conforming to IS:1255.
- e. While preparing cable schedules for control/protection purpose, following shall be ensured:
  - Separate cables shall be used for AC & DC.
  - Separate cables shall be used for DC1 & DC2.
- f. Separate cable shall be used for different cores of CT & CVT.
- g. At least one core shall be kept as spare in each copper control cable of 4C, 5C or 7C size whereas minimum no. of spare cores shall be two for control cables of 10 core or higher size.
- h. For control cabling, including CT/VT circuits, 2.5 mm<sup>2</sup> size copper cables shall be used per connection. However, if required from voltage drop/VA burden consideration, additional cores shall be used. Further for potential circuits of energy meters, separate connections with 2 cores of 2.5 mm<sup>2</sup> size shall be provided.
- i. Standard technical data sheets for cable sizes up to and including 1100V are enclosed at Annexure-I, II & III. Cable sizes shall be offered/manufactured in accordance with parameters specified in standard technical data sheets. Technical data sheets for any other cores/sizes required during detailed engineering shall be separately offered for employer's approval by the contractor/supplier. **Submission of standard technical data sheets for these cable sizes are not required for approval.** The contractor/supplier shall intimate the name of proposed approved cable manufacturer along with cable sizes, its quantity

required during detailed engineering for purchaser's information and acceptance.

## 2.2 METHODOLOGY OF SUPPLY, INSTALLATION AND SIZING OF CABLE

### a. Supply of 1.1kV Grade Cable:

- The quantities of various types of 1.1kV grade power and control cable shall be assessed by bidder and same shall be mutually agreed.
- The cable from Control room/SPR/ACDB/DCDB/BMK to Equipment Marshalling Box/Local Control Cubicle shall be assessed by bidder and same shall be mutually agreed.
- The interpole cable between AIS instrument transformer (CT/CVT) and associated junction box shall be assessed by bidder and same shall be mutually agreed.
- The interpole cable between Circuit Breaker, Isolator and associated marshalling box deemed to be included in the price of equipment.

### b. Installation of 1.1kV Grade Cable:

- The installation of 1.1kV grade power and control cable shall be assessed by contractor/bidder for complete scope of work specified in Section-Project and shall be quoted in "LOT" basis.
- Supply and installation of cable accessories like lugs, glands etc from entire cabling work shall be deemed to be included in installation charges quoted by bidder in BOQ.
- No variation shall be admissible on account of installation of cable/supply and installation of associated accessories, irrespective of variation (positive or negative) in supply quantities of cable specified in BOQ.

### c. Extra consumption of 1.1kV Grade Cable:

- Claim for cable quantity variation from agreed quantity shall only be acceptable if the variation is more than  $\pm 15\%$ .
- The contractor shall make every efforts to minimize wastage of the cable during installation. The overall wastage permitted is limited to 0.5% of actual quantity supplied for each size of cable.
- Any wastage more than above limit shall be recovered from contractor.
- All balance unused cable shall be returned to employer by rewinding in separate drums.

### d. Scrap of 1.1kV Grade Cable:

- Cut piece of cable having less than following shall be considered as scrap.  
Length less than 20M  
Control Cable having 10C or less  
Power Cable (2Cx6, 4Cx6 and 4Cx16mm<sup>2</sup>)  
  
Length less than 50M  
Control Cable having more than 10C  
Power Cable of size above 16mm<sup>2</sup>
- The contractor shall dispose of scrap at their own cost.

### e. Cable for Illumination purpose:

- From ACP to luminous, all the required cables, accessories (including lugs and glands), SLP/JB etc. as required shall be assessed and supplied by contractor.

- The price of these items shall be deemed to be included in price of luminaries.
- f. Annexures:
  - Refer following annexures of sizing of 1.1kV grade power and control cables.  
PVC Control cable – Annexure-IV  
PVC Power cable – Annexure-V  
XLPE Power cable – Annexure-VI

## 2.3 TECHNICAL SPECIFICATIONS

### 2.3.1 GENERAL

- a. The cables shall be suitable for laying in trenches, racks, ducts and underground buried installation with uncontrolled back fill and chances of flooding by water.
- b. All the cables shall pass fire resistance test as per IS:1554 (Part-I).
- c. The Aluminium/Copper wires used for manufacturing the cables shall be true circular in shape before stranding, of uniformly good quality and free from defects. All Aluminium used in the cables for conductors shall be of H2 grade. In case of single core cables armours shall be of H4 grade Aluminium.
- d. Cable shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transient operating conditions.
- e. The fillers and inner sheath shall be of non-hygroscopic, fire-retardant material, shall be softer than insulation. The outer sheath shall be suitable for the operating temperature of the cable.
- f. Progressive sequential marking of the length of cable in metres at **every one metre** shall be provided on the outer sheath of all cables.
- g. Repaired cables shall not be accepted.
- h. Allowable tolerance on the overall diameter of the cables shall be **plus or minus 2 mm**.
- i. The XLPE /PVC insulated L.T. power cables of **size 240 mm<sup>2</sup> and above** shall withstand without damage a 3-phase fault current of at least **45 kA for at least 0.12 second**, with an initial peak of 105 kA in one of the phases at rated conductor temperature (70°C for PVC insulated cables and 90°C for XLPE insulated cables). The armour for these power cables shall be capable of carrying 45 kA for at least 0.12 seconds without exceeding the maximum allowable temperature of PVC outer sheath.
- j. Conductor temperature withstanding capability of XLPE insulated cables during a short circuit without any damage shall be **250°C** while Conductor temperature withstanding capability of PVC insulated cables during a short circuit without any damage shall be **160°C**.
- k. The normal current rating of all PVC insulated cables shall be as per IS:3961.
- l. The material of outer sheath of cable shall have oxygen index & temperature index of **more than or equal to 29 and 250°C** respectively.
- m. For control cables only round wire armouring shall be used. Strip wire armoring method (a) mentioned in Table 5, Page-6 of IS: 1554 (Part 1) – 1988 shall not be accepted for any of the cables.

### 2.3.2 PVC POWER & CONTROL CABLES

- a. The PVC (70°C) insulated power & control cables shall be of FRLSH type, C2 category, conforming to IS: 1554 (Part-I) and its amendments read along with this specification. The Power cable shall be suitable for a steady conductor temperature of 70°C.
- b. The conductor shall be stranded copper for control cable and stranded aluminium for power cable.
- c. The Insulation shall be extruded PVC to type-A of IS: 5831. A distinct inner sheath shall be provided in all multicore cables. For multicore armored Power cables, the inner sheath shall be of extruded PVC.
- d. All cables shall be of armoured type. The outer sheath shall be extruded PVC to Type ST-1 of IS: 5831 for all cables. For Control cable it should be grey in colour.
- e. In Control cables, cores shall be identified as per IS: 1554 (Part-1) for the cables up to five (5) cores and for cables with more than five (5) cores the identification of cores shall be done by printing legible Hindu Arabic Numerals on all cores as per clause 10.3 of IS 1554 (Part-1).

### 2.3.3 XLPE POWER CABLES

- a. The XLPE (90°C) insulated cables shall be of FRLSH type, C2 category conforming to IS:7098 (Part-I) and its amendments read along with this specification.
- b. The conductor shall be stranded aluminium circular/sector shaped and compacted. In multicore cables, the core shall be identified by red, yellow, blue and black coloured strips or colouring of insulation. A distinct inner sheath shall be provided in all multicore cables.
- c. All cables shall be of armoured type. For single core cables, the armouring shall consist of aluminium wires/strips. The outer and inner sheath shall be extruded PVC of Type ST-2 of IS:5831 for all XLPE cables.

## 3. HV POWER CABLES [FOR WORKING VOLTAGES FROM 3.3 kV AND INCLUDING 33 kV]

### 3.1 HV POWER CABLE FOR AUXILIARY POWER SUPPLY

- a. The HV cable of 1Cx185 mm<sup>2</sup> (Aluminium Conductor) or 1Cx120mm<sup>2</sup> (Copper Conductor) of voltage class as specified for 630 kVA and 800 kVA LT transformer for interconnecting 630kVA and 800 kVA LT transformer to the SEB feeder shall be, XLPE insulated, armoured cable conforming to IS 7098 (Part-II) or IEC: 60502-2 1998.
- b. The HV cable of 3Cx95 mm<sup>2</sup> (Aluminium Conductor) or 3Cx70mm<sup>2</sup> (Copper Conductor) of voltage class as specified for 250kVA LT transformer for interconnecting 250kVA LT transformer to the SEB feeder shall be, XLPE insulated, armoured cable conforming to IS 7098 (Part-II) or IEC 60502-2 1998.
- c. Terminating accessories for cables mentioned in clause (a) and (b) shall conform to IS 17573-1992 or IEC 61442-1997/IEC60502-4 1998.

- 3.2 For interconnecting 630 kVA and 800 kVA, LT transformer to the tertiary of the ICT, only overhead connection has been foreseen, unless specified in Section-project. If HV cable is used in place of overhead connection, shall be in contractor's scope. In this case contractor shall provide 1C x 185 mm<sup>2</sup> (Aluminium Conductor) or 1Cx120mm<sup>2</sup> (Copper Conductor), 38/66kV HV cable along with necessary terminating accessories. The construction of XLPE insulated, armoured HV cable shall be generally conforming to IS 7098 (Part-III). Terminating accessories shall conform to IEC60840 1999.
- 3.3 Bidder may offer sizes other than the sizes specified in clause 3.1 and 3.2. In such case sizing of power cables shall be done keeping in view continuous current, voltage drop & short-circuit consideration of the system. Relevant calculations shall be submitted by bidder during detailed engineering for purchaser's approval.

### 3.4 CONSTRUCTIONAL REQUIREMENTS

- a. Cable shall have compacted circular Aluminium conductor, Conductor screened with extruded semi conducting compound, XLPE insulated, insulation screened with extruded semi conducting compound, distinct extruded PVC inner sheath (Type ST-2) with FR properties, armoured with non-magnetic material for single core cables and galvanized steel wire/strip for multicore cables, followed by extruded PVC outer sheath (Type ST-2), with FR properties.
  - b. The armor shall be capable of withstanding rated short time current of conductor.
- 3.5 The material of outer sheath of cable shall have oxygen index & temperature index of more than or equal to 29 and 250°C respectively.
- 3.6 Progressive sequential marking of the length of cable in metres at every one metre shall be provided on the outer sheath of the cable.
- 3.7 Allowable tolerance on the overall diameter of the cables shall be plus or minus 2 mm.

## 4. EHV XLPE POWER CABLE [FOR WORKING VOLTAGES FROM 66 kV UP TO AND INCLUDING 500 kV]

- 4.1 Cable shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transient operating conditions.
- 4.2 The cable shall be of specified EHV grade, single core, unarmored, stranded compacted Copper conductor, core screening by a layer of semiconducting tape followed by a layer of semiconducting compound, XLPE dry cured insulation, insulation screening with semiconducting compound extruded directly over the insulation, longitudinal sealing by a layer of non-woven tape with water swellable absorbent over insulation screen, followed by radial sealing (Metal sheath of Lead alloy 'E'), metallic screening by concentric layer of plain copper wire followed by an open helix of copper & overall HDPE sheathed & graphite coated and conforming to the technical particulars of specification.
- 4.3 The XLPE insulated EHV cable shall conform to the requirements of IEC 60502-2 (applicable clauses only) for construction and IEC 60840/ IEC62067 (as applicable) for testing. The terminating accessories shall conform to IEC 60840 / IEC62067 (as applicable).
- 4.4 The construction of cable shall generally conform to the description mentioned in above



mentioned clause of the specification. Bidder may offer necessary layers such as separation tape, binder tapes etc additionally as per their manufacturing practices for meeting required performance of the offered cable. The bidder shall enclose with the bid, drawing showing cross section of the cable. The conductors screen (non-metallic semi-conductive) shall be extruded in a single one-time process to ensure homogeneity and absence of voids.

4.5 Progressive sequential marking of the length of cable in metres at every one metre shall be provided on the outer sheath of the cable.

4.6 Repaired cables shall not be accepted.

4.7 Allowable tolerance on the overall diameter of the cables shall be plus or minus 2 mm.

## 5. CABLE DRUMS

5.1 Cables shall be supplied in **returnable wooden or steel drums** of heavy construction. Drums offered shall conform to relevant standards. Wooden drum shall be properly seasoned sound and free from defects. Wood preservative shall be applied to the entire drum. **Drum drawings are not required to be submitted for approval.**

5.2 Standard lengths for each size of power and control cables shall be 500/1000 meters. However, to avoid cable wastage and cable jointing at site, nonstandard lengths of each size of Power & Control cable may also be acceptable subject to maximum length of 1000 meters (+ 5% tolerance).

5.3 Each drum shall carry the manufacturer's name, the purchaser's name, address and contract number and type, size and length of the cable, net and gross weight stencilled on both sides of drum. A tag containing the same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled. A clear space of at least 40 mm shall be left between the cables and the lagging. A layer of waterproof paper shall be applied to the surface of the drums and over the outer most cable layer.

5.4 Packing shall be adequate to protect the cables, from any injury due to mishandling or other conditions encountered during transportation, handling and storage. Both cable ends shall be sealed with PVC/Rubber caps to eliminate ingress of water during transportation and erection.

## 6. TYPE TEST REPORT

6.1 Only type tested Power & Control Cables are to be offered conforming to our technical specification, and relevant IS and IEC. Power & Control Cables offered should be similar with ones on which type testing has been carried out as per relevant IS and IEC.

6.2 Complete type test reports carried out in Govt. recognized Test House or Laboratory /NABL accredited laboratory shall have to be submitted.



## Annexure-I

## Standard Technical Data Sheet - (1.1 kV Grade XLPE Power Cable)

S. No.	Customer:		
	Name of manufacturer:	As per approved list	
	Cable Sizes	1C x 630	3½C x 300
1	Manufacturer's type designation	A2XWaY	A2XWY
2	Applicable standard	IS: 7098/PT-I/1988 & its referred specifications	
3	Rated Voltage(volts)	1100 V grade	
4	Type & Category	FRLSH & C2	FRLSH & C2
5	Suitable for earthed or unearthed system	for both	
6	Continuous current rating when laid in air in ambient temp. of 50°C and for maximum conductor temp. of 70°C of PVC Cables [For information only]	732	410
7	Rating factors applicable to the current ratings for various conditions of installation:	As per IS-3961-Pt-II-67	
8	Short circuit Capacity		
a)	Guaranteed Short Circuit current (rms) for 0.12 sec duration at rated conductor temperature of 90°C, with an initial peak of 105kA	45 KA	45 KA
b)	Maximum Conductor temp. allowed for the short circuit duty as stated above.	250°C	
9	Conductor		
a)	Material	Stranded Aluminium as per Class 2 of IS: 8130	
b)	Grade	H2 (Electrolytic grade)	
c)	Cross Section area (mm²)	630	300/150
d)	Minimum number of wires	53	30/15
e)	Form of Conductor	Stranded and compacted circular	Stranded compacted circular/sector shaped
f)	Direction of lay of stranded layers	Outermost layer shall be R.H lay & opposite in successive layers	
10	Conductor resistance (DC) at 20°C per km-maximum	0.0469	0.1 / 0.206
11	Insulation		
a)	Composition of insulation	Extruded XLPE as per IS-7098 Part(1)	
b)	Nominal thickness of insulation(mm)	2.8	1.8/1.4
c)	Minimum thickness of insulation(mm)	2.42	1.52/1.16
12	Inner Sheath		
a)	Material	-----Extruded PVC type ST-2 as per IS-5831-84-----	
b)	Calculated diameter over the laid-up cores (mm)	NA	52
c)	Minimum thickness of sheath (mm)	NA	0.6
d)	Method of extrusion	NA	Pressure/Vacuum extrusion
13	Armour		
a)	Type and material of armour	Al. wire [H4 grade]	Gal. Steel wire
b)	Direction of armouring	left hand	
c)	Calculated diameter of cable over inner sheath (under armour), mm	33.9	53.2
d)	Nominal diameter of round armour wire (minimum)	2	2.5
e)	Guaranteed Short circuit capacity of the armour for 0.12 sec at room temperature.	45 KA	45 KA
f)	DC resistance at 20°C (Ω/Km)	\$	0.577
14	Outer Sheath		
a)	Material (PVC Type)	ST-2 & FR	ST-2 & FR
b)	Calculated diameter under the sheath	38.3	59.50
c)	Minimum thickness of sheath(mm)	1.72	2.36
d)	Guaranteed value of oxygen index of outer sheath at 27°C (Min)	Min 29.0	Min 29.0
e)	Guaranteed value of temperature index at 21 oxygen index (Min.)	Min 250	Min 250
f)	color of sheath	Black	Black
15	Nominal Overall diameter of cable	\$	\$
	Tolerance on overall diameter (mm)	(+/-) 2mm	
16	Cable Drums	shall conform to IS 10418 and technical specification	
a)	Max./ Standard length per drum for each size of cable (single length) with ±5% Tolerance (mtrs)	1000/500	1000/500
b)	Non-standard drum lengths	Nonstandard lengths of each size of Power & Control cable may also be acceptable subject to maximum length of 1000meters (+ 5% tolerance)	
17	Whether progressive sequential marking on outer sheath provided at 1 meter interval	YES	
18	Identification of cores		
a)	Color of cores	As per IS 7098 Part (1)	
b)	Numbering	NA	
19	Whether Cables offered are ISI marked	YES	
20	Whether Cables offered are suitable for laying as per IS 1255	YES	

'\$'- As per manufacturer design data

## Annexure-II

## Standard Technical Data Sheet - (1.1 kV Grade PVC Power Cable)

S. No.	CUSTOMER:						
	Name of manufacturer:	As per approved list					
	Cable Sizes	1C x 150	3.5C x 70	3.5C x 35	4C x 16	4C x 6	2C x 6
1	Manufacturer's type designation	AYWaY	AYFY	AYFY	AYFY	AYWY	AYWY
2	Applicable standard	IS: 1554/PT-I/1988 & its referred standards					
3	Rated Voltage(volts)	1100 V grade					
4	Type & Category	FRLSH & C2	FRLSH & C2	FRLSH & C2	FRLSH & C2	FRLSH & C2	FRLSH & C2
5	Suitable for earthed or unearthed system	for both					
6	Continuous current rating when laid in air in ambient temp. of 50°C and for maximum conductor temp. of 70°C of PVC Cables [For information only]	202	105	70	41	24	28
7	Rating factors applicable to the current ratings for various conditions of installation:	As per IS-3961-Pt-II-67					
8	Short circuit Capacity						
a)	Short Circuit current (rms) kA for 1 sec duration	11.2	5.22	2.61	1.19	0.448	0.448
b)	Conductor temp. allowed for the short circuit duty (°C)	160°C					
9	Conductor						
a)	Material	STRANDED ALUMINIUM					
b)	Grade	H2 (Electrolytic grade)					
c)	Cross Section area (Sq.mm.)	150	M-70 N-35	M-35 N-16	16	6	6
d)	Number of wires (No.)	As per Table 2 of IS 8130					
e)	Form of Conductor	Non-compacted Stranded circular	Shaped Conductor	Shaped Conductor	Shaped Conductor	Non-compacted Stranded circular	Non-compacted Stranded circular
f)	Direction of lay of stranded layers	Outermost layer shall be R.H lay & opposite in successive layers					
10	Conductor resistance (DC) at 20°C per km-maximum	0.206	0.443/ 0.868	0.868/ 1.91	1.91	4.61	4.61
11	Insulation						
a)	Composition of insulation	Extruded PVC type A as per IS-5831-84					
b)	Nominal thickness of insulation (mm)	2.1	1.4/1.2	1.2/1.0	1.0	1.0	1.0
c)	Minimum thickness of insulation (mm)	1.79	1.16/0.98	0.98/0.8	0.8	0.8	0.8
12	Inner Sheath						
a)	Material	Extruded PVC type ST-I as per IS-5831-84					
b)	Calculated diameter over the laid-up cores (mm)	NA	27.6	20.4	15.7	11.6	9.6
c)	Minimum thickness of Sheath (mm)	NA	0.4	0.3	0.3	0.3	0.3
13	Armour	As per IS 3975/88					
a)	Type and material of armour	Al. Wire [H4 grade]	Gal. Steel strip	Gal. Steel strip	Gal. Steel strip	Gal. Steel wire	Gal. Steel wire
b)	Direction of armouring	left hand					
c)	Calculated diameter of cable over inner sheath (under armour), mm	18	28.4	21	16.3	12.2	10.2
d)	Nominal diameter of round armour wire/strip	1.6	4 x 0.8	4 x 0.8	4 x 0.8	1.4	1.4
e)	Number of armour wires/strips	Armouring shall be as close as practicable					
f)	Short circuit capacity of the armour along for 1 sec [For information only]	$K \times A \sqrt{t}$ (kA) (where A = total area of armour in mm <sup>2</sup> & t = time in seconds), K=0.091 for Al & 0.05 for steel					
g)	DC resistance at 20 °C (Ω/Km)	0.44	2.57	3.38	3.99	3.76	4.4
14	Outer Sheath						
a)	Material (PVC Type)	ST-1& FR					
b)	Calculated diameter under the sheath	21.2	30.1	22.6	17.9	15	13
c)	Minimum thickness of sheath(mm)	1.3	1.56	1.4	1.4	1.4	1.24
d)	Guaranteed value of minimum oxygen index of outer sheath at 27°C	Min 29.0					
e)	Guaranteed value of minimum temperature index at 21 oxygen index	Min 250					
f)	color of sheath	Black					
15	a) Overall diameter of cable	\$					
b)	Tolerance on overall diameter (mm)	(+/-) 2 mm					
16	Cable Drums	Shall conform to IS 10418 and technical specification					
a)	Max./ Standard length per drum for each size of cable (single length) with ±5% Tolerance (mtrs)	1000/500					
b)	Non-standard drum lengths	Nonstandard lengths of each size of Power & Control cable may also be acceptable subject to maximum length of 1000meters (+ 5% tolerance)					
17	Whether progressive sequential marking on outer sheath provided	YES					
18	Identification of cores						
a)	color of cores	Red	R,Y,B & Black	R,Y,B & Black	R,Y,B & Black	R,Y,B & Black	Red & Black
b)	Numbering	NA					
19	Whether Cables offered are ISI marked	YES					
20	Whether Cables offered are suitable for laying as per IS 1255	YES					

\*S'- As per manufacturer design data

## Annexure-III

## Standard Technical Data Sheet - (1.1 kV Grade PVC Control Cable)

	CUSTOMER:	
S. No.	Name of manufacturer:	As per approved list
	Cable Sizes	2C x 2.5 3C x 2.5 5 C x 2.5 7C x 2.5 10C x 2.5 14C x 2.5 19C x 2.5 27C x 2.5
1	Manufacturer's type designation	YWy YWy YWy YWy YWy YWy YWy YWy
2	Applicable standard	IS: 1554/PT-I/1988 & its referred standards
3	Rated Voltage(volts)	1100
4	Type & Category	FRLSH & C2
5	Suitable for earthed or unearthed system	for both
6	Continuous current rating when laid in air in ambient temp. of 50°C and for maximum conductor temp. of 70°C of PVC Cables [For information only]	22 19 19 14 12 10.5 9.7 8
7	Rating factors applicable to the current ratings for various conditions of installation:	As per IS-3961-Pt-II-67
8	Short circuit Capacity	
a)	Short Circuit Current (rms) kA for 1 sec [for information only]	0.285
b)	Conductor temp. allowed for the short circuit duty (deg°C)	160°C
9	Conductor	
a)	Material	Plain annealed High Conductivity stranded Copper (as per IS 8130/84)
b)	Grade	Electrolytic
c)	Cross Section area (Sq.mm.)	2.5
d)	Number of wires (No.)	As per Table 2 of IS 8130
e)	Form of Conductor	Non-Compacted stranded circular conductor
f)	Direction of lay of stranded layers	Outermost layer shall be R.H lay
10	Conductor resistance (DC) at 20°C per km (maximum)	7.41
11	Insulation	
a)	Composition of insulation	Extruded PVC type A as per IS-5831-84
b)	Nominal thickness of insulation (mm)	0.9
c)	Minimum thickness of insulation (mm)	0.71
12	Inner Sheath	
a)	Material	Extruded PVC type ST-I as per IS-5831-84
b)	Calculated diameter over the laid-up cores, (mm)	7.2 7.8 9.7 10.8 14.4 15.9 18 22.1
c)	Minimum thickness of Sheath (mm)	0.3
13	Armour	As per IS 3975/99
a)	Type and material of armour	Galvanised Steel wire
b)	Direction of armouring	Left hand
c)	Calculated diameter of cable over inner sheath (under armour), mm	7.8 8.4 10.3 11.4 15 16.5 18.6 22.7
d)	Nominal diameter of round armour wire / dimensions of armour strip	1.4 1.4 1.4 1.4 1.6 1.6 1.6 1.6
e)	Number of armour wires	Armouring shall be as close as practicable
f)	Short circuit capacity of the armour and duration [for info only]	$0.05 \times A \sqrt{t}$ (K Amp) (where A = total area of armour in mm <sup>2</sup> & t = time in seconds)
g)	DC resistance at 20°C (Ω/Km) & Resistivity of armour	As per IS 1554 Part (1), wherever applicable & IS 3975-1999
14	Outer Sheath	
a)	Material (PVC Type)	ST-I & FR
b)	Calculated diameter under the sheath	10.6 11.2 13.1 14.2 18.2 19.7 21.8 25.9
c)	Minimum thickness of sheath (mm)	1.24 1.24 1.24 1.24 1.4 1.4 1.4 1.56
d)	Guaranteed value of minimum oxygen index of outer sheath	Min 29.0
e)	Guaranteed value of minimum temperature index at 21 oxygen index	Min 250
f)	color of sheath	Grey
15	a) Overall diameter of cable	\$
	b) Tolerance on overall diameter (mm)	(+/-) 2 mm
16	Cable Drums	shall conform to IS 10418 and technical specification
a)	Max./ Standard length per drum for each size of cable (single length) with ±5% Tolerance (mtrs)	1000/500
b)	Non-standard drum lengths	Nonstandard lengths of each size of Power & Control cable may also be acceptable subject to maximum length of 1000meters (+ 5% tolerance)
17	Whether progressive sequential marking on outer sheath provided	YES
18	Identification of cores	
a)	color of cores	R & Black R,Y & Blue R ,Y,BI,Bk&Grey Grey Grey Grey Grey
b)	Numbering	NA NA NA Numerals in Black ink
19	Whether Cables offered are ISI marked	YES
20	Whether Cables offered are suitable for laying as per IS 1255	YES

'S' - As per manufacturer design data

**Annexure-IV**
**1.1kV Grade PVC Control Cable size**

S. No.	From	To	Proposed Cable Size
1.	CB MB	CRP Panels	i). 10C x 2.5 ii). 19C x 1.5 iii). 27C x 1.5
2.	CB MB	Earth Switch MB	i). 3C x 2.5 ii). 5C x 2.5
3.	Isolator MB	Earth Switch MB	10C x 2.5
4.	Isolator MB	CRP Panels	19C x 1.5
5.	CT	CT JB	i). 5C x 2.5 ii). 10C x 2.5
6.	CT JB	CRP Panels	
7.	CVT	CVT JB	
8.	CVT JB	CRP Panels	
9.	Reactor MB/CMB	CRP Panels	i). 3C x 2.5 ii). 5C x 2.5 iii). 19C x 1.5
10.	ICT MB/CMB	CRP Panels	iv). 27C x 1.5 v). Paired cables

**Note:**

- For application in addition to those specified above, appropriate cable size shall be considered by the contract with prior approval of Employer during execution stage.

GTP of 1.5mm<sup>2</sup> cable shall be submitted during detailed engineering stage for employer's approval.

### 1.1kV Grade XLPE Power Cable size

S. No.	From	To	Proposed Cable Size
1.	Main Switch Board	LT Transformer	2 - 1C x 630mm <sup>2</sup> per Phase 1 - 1C x 630 mm <sup>2</sup> for Neutral
2.	Main Switch Board	AC Distribution Board	2 - 3½C x 300 mm <sup>2</sup>
3.	Main Switch Board	Oil Filtration Unit & looping to other oil filtration units.	1 - 3½C x 300 mm <sup>2</sup>
4.	Main Switch Board	Colony Lighting	1 - 3½C x 300 mm <sup>2</sup>
5.	Main Switch Board	HVW pump LCP	1 - 3½C x 300 mm <sup>2</sup>
6.	Main Switch Board	Main Lighting distribution board	2 - 3½C x 300 mm <sup>2</sup>
7.	AC Distribution Board	D.G. Set AMF Panel	For 500KVA DG Set 2 - 3½C x 300 mm <sup>2</sup>  For 250KVA DG Set 1 - 3½C x 300 mm <sup>2</sup>

### 1.1kV Grade PVC Power Cable size

S. No.	From	To	Proposed Cable Size
1.	AC Distribution Board	Emergency Lighting distribution board	For 765/400kV S/s 1 - 3½C x 70 mm <sup>2</sup>  For 400/220kV S/s 1 - 3½C x 35 mm <sup>2</sup>
2.	AC Distribution Board	ICT/Reactor MB	
3.	AC Distribution Board	Bay MB	
4.	Bay MB	AC Kiosk	1 - 4C x 16 mm <sup>2</sup>
5.	AC Distribution Board	220V Battery Charger	1 - 3½C x 70 mm <sup>2</sup>
6.	AC Distribution Board	48V Battery Charger	1 - 3½C x 35 mm <sup>2</sup>
7.	DCDB	Battery	2 - 1C x 150 mm <sup>2</sup>
8.	DCDB	Battery Charger	2 - 1C x 150 mm <sup>2</sup>
9.	DCDB	Protection/PLCC panel	For 765/400kV S/s 1 - 4C x 16 mm <sup>2</sup>  For 400/220kV S/s 1 - 4C x 6 mm <sup>2</sup>
10.	Main Lighting DB	Lighting panels (Indoor)	1 - 3½C x 35 mm <sup>2</sup>
11.	Main Lighting DB	Receptacles (Indoor)	
12.	Main Lighting DB	Lighting panels (Outdoor)	1 - 3½C x 70 mm <sup>2</sup>
13.	Main Lighting DB	Receptacles (Outdoor)	
14.	Lighting Panel	Sub lighting panels	These cable shall be deemed to be included in price of lighting fixture.
15.	Lighting Panel	Street Lighting Poles	
16.	Lighting Panel/Sub Lighting Panels	Lighting Fixtures (Outdoor)	
17.	Bay MB	Equipment	For CB 1 - 4C x 16 mm <sup>2</sup>  For Isolator/Earth-Switch 1 - 4C x 6 mm <sup>2</sup>  For CT/CVT 1 - 2C x 6 mm
18.	Emergency Lighting distribution board	Lighting Panels	For 765/400kV S/s 1 - 3½C x 70 mm <sup>2</sup>  For 400/220kV S/s 1 - 3½C x 35 mm <sup>2</sup>